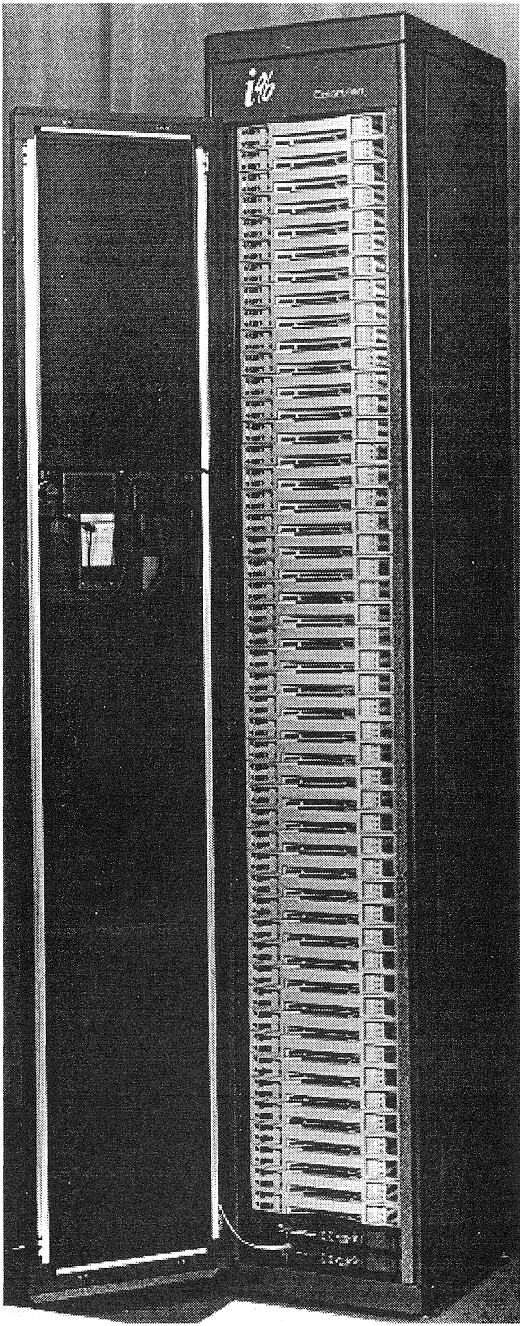


i48 and i96 Dimmer Rack Installation and Maintenance Manual



*i*series

Contractor:

Please read these instructions and refer to project drawings before starting installation. After installation, please forward these instructions to the user for operation and maintenance purposes.

Colortran

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Version 2.0

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LIT-30955-0

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Note before beginning installation:

Some systems are purchased with Engineering Check Out (ECO). ECO is the services of a factory authorized engineer to test and configure the system and provide operation and maintenance training. Check with your purchaser to find out if ECO is included with your system.

If ECO was purchased, stop at Chapter 20 and contact your purchaser for "ECO request forms." Please note that Colortran requires 2 weeks from written notification to schedule ECO.

Installation

1. Introduction

The *i* Series dimmer racks have been designed to be front-wired and easy to install. The racks are electrical distribution equipment which are connected in a manner similar to a circuit breaker panel board. This manual will tell you how to assemble, locate, wire, test and maintain the *i48* or *i96* dimmer rack and all necessary control equipment. Please familiarize yourself with both this manual and the drawings supplied for your job before beginning the installation.

In the USA, this equipment is intended to be installed in accordance with the National Electrical Code and local electrical regulations. In Canada, installation shall be in accordance with the Canadian Electrical Code.

Additional information regarding control equipment and electronic configuration of the *i48* or *i96* rack is available in the *i* Series Control Accessories User's Guide and the *i* Series PC Software User's Guide.

2. Unpack Racks

Each *i48* or *i96* rack is shipped with the following:

- ◆ 2 keys
- ◆ a set of circuit number labels (if the racks are not pre-numbered at the factory as per the job specifications)
- ◆ Installation and Maintenance Manual (this document)

The following equipment is shipped separately from the rack:

- ◆ 24 (*i48*) or 48 (*i96*) dimmer, constant or filler modules per rack
- ◆ 1, or optionally 2 control modules per rack
- ◆ 1 Hand Held Terminal per rack (optional)

The dimmer, constant, filler and control modules, and the Hand Held Terminal should be left in their original packing and stored in a clean, dry place until they are to be installed.

After unpacking, please inspect the rack for any possible shipping damage. Document any shipping damage, and contact the freight company and Colortran.

3. Reassemble Multiple Rack Systems

Note: The i96 rack assembly is shown below. The i48 assembly is similar.

If you are installing a multiple rack system that has been disassembled for shipping, you will need to follow the instructions below to reassemble the racks.

If, instead, you have only one rack, or factory assembled racks shipped in one section, or individual racks at various locations, no assembly is required. Go on to the next section, titled "Locate Racks."

Note: In order to access the front bolts required to join the two rack sections together it is necessary to do the following:

At top of rack:

1. Remove the 4 screws holding the conduit access plate and remove the plate.
2. Remove the 6 screws holding the fan mounting plate.
3. Slide the fan mounting plate towards the rear, taking care that the interconnecting cables are not damaged.
4. Install bolt(s)
5. Slide fan mounting plate towards the front, taking care that the interconnecting cables are not pinched in the metalwork or fan blades.
6. Install the 6 screws to secure the fan mounting plate.
7. Replace the conduit access plate and secure with the 4 screws when instructed to do so elsewhere in the manual.

At bottom of rack:

1. Remove the control module tray. See instructions later in this section.
2. Install bolt(s).
3. Replace the control module tray when instructed to do so elsewhere in this manual.

To reassemble a multiple rack system:

1. Line up the *i* Series racks in the order shown on project drawings.
2. Verify that any protruding bussing lines up with its mating part and that the black Lexan panels are completely in place to seal the opening between the racks. Slide the rack sections together. See Figure 3.
3. Bolt the racks together at the four mounting holes with 5/16" keps nut, large spacer washer, toothed lockwasher and bolt sets (supplied). Make sure the lockwasher is under the head of the bolt and the large spacer washer is between the racks.
4. If the sections contain lateral bussing, line up the mating parts, including any spacers or stiffeners provided. See Figures 1 and 2 for proper assembly order of phase and neutral bussing, and Figures 4 and 5 for details.
5. Bolt the bus bars together with thw 3/8" bolts, flat washers (one per side), lock washers, spacers (if required), and nuts (supplied). Tighten to a torque of 20 ft. lbs (27 N-M). See Figures 1,2 and 6.

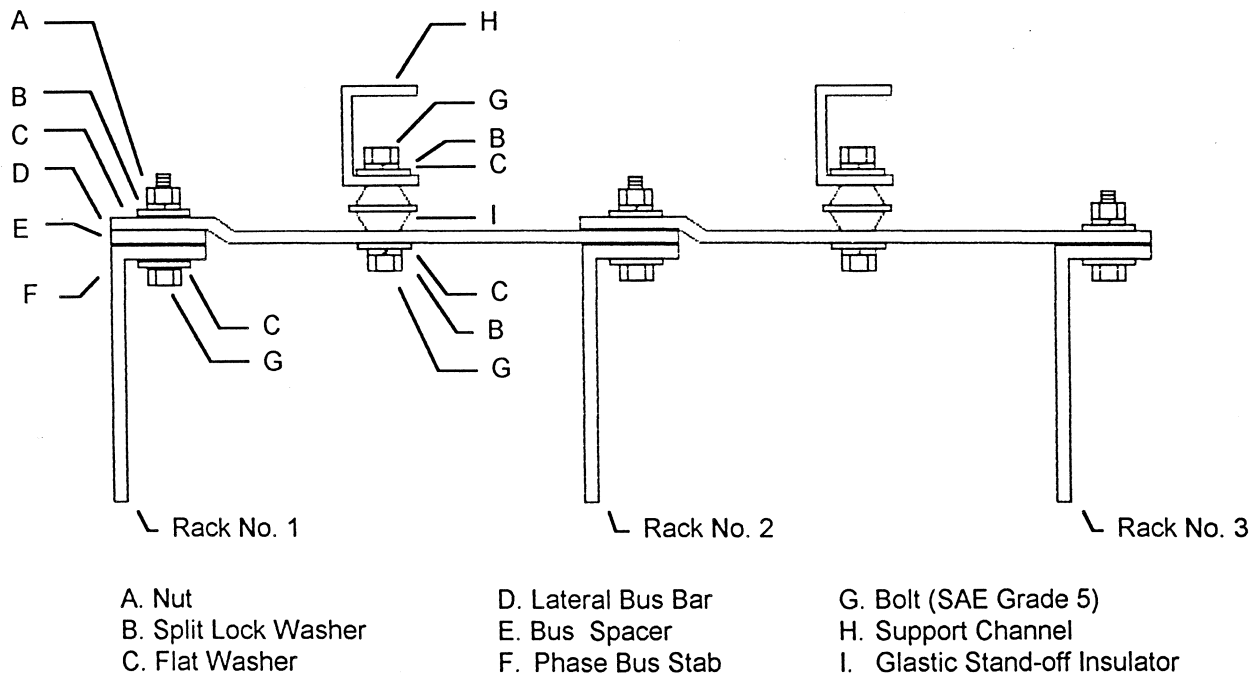


Figure 1: Typical Phase Bussing Assembly (Top View)

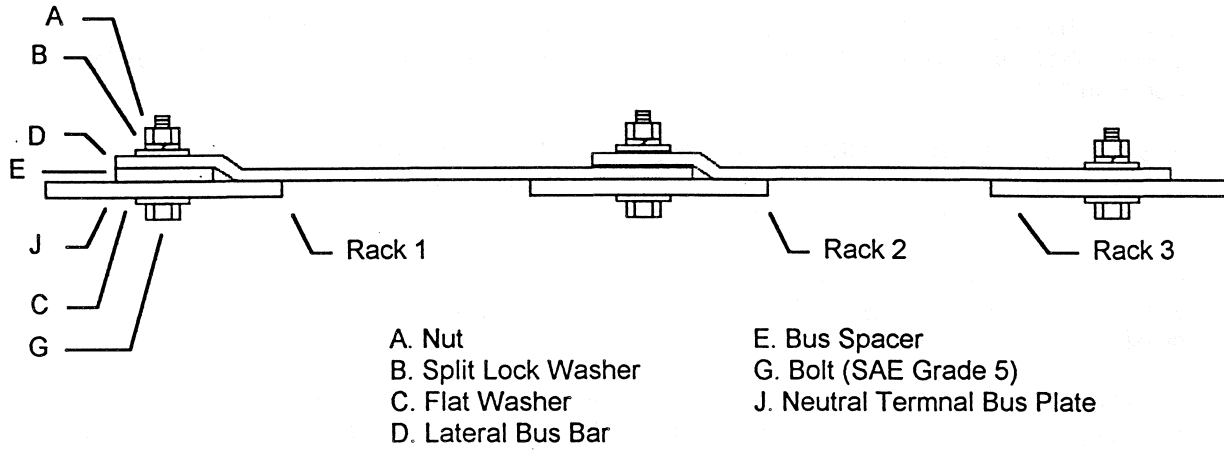


Figure 2: Typical Neutral Bussing Assembly (Top View)

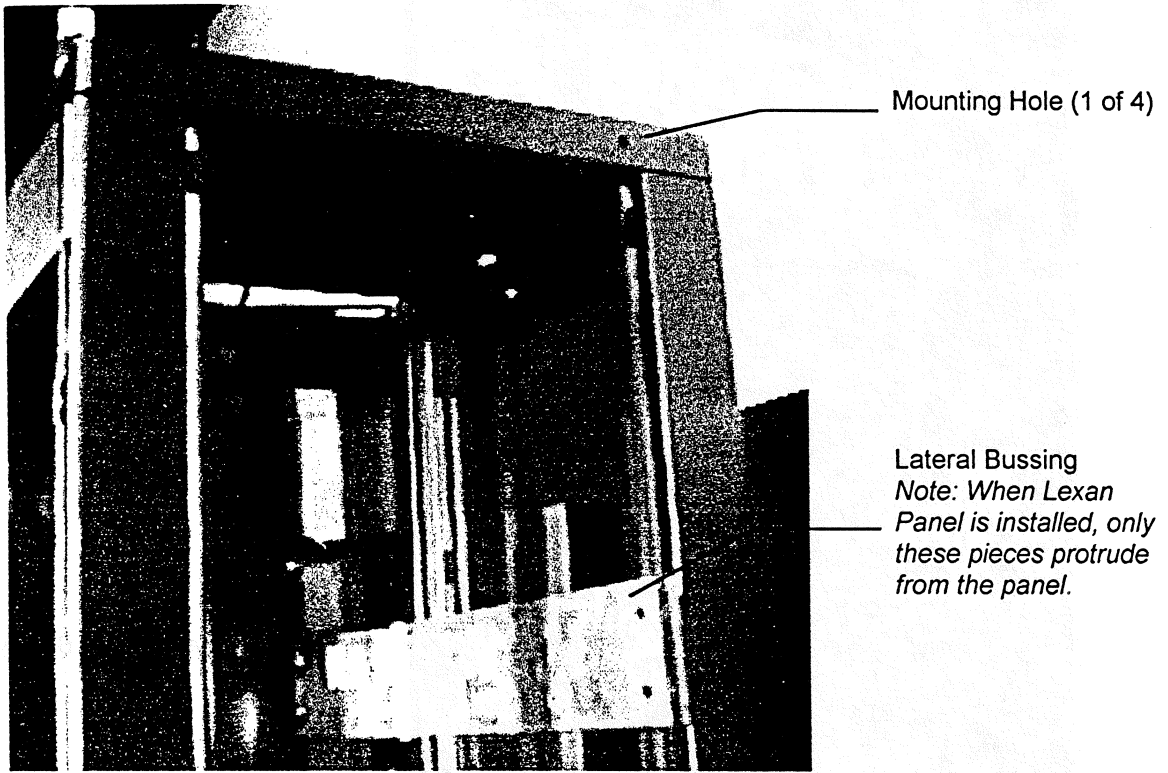


Figure 3: Typical Lateral Bussing, Side View

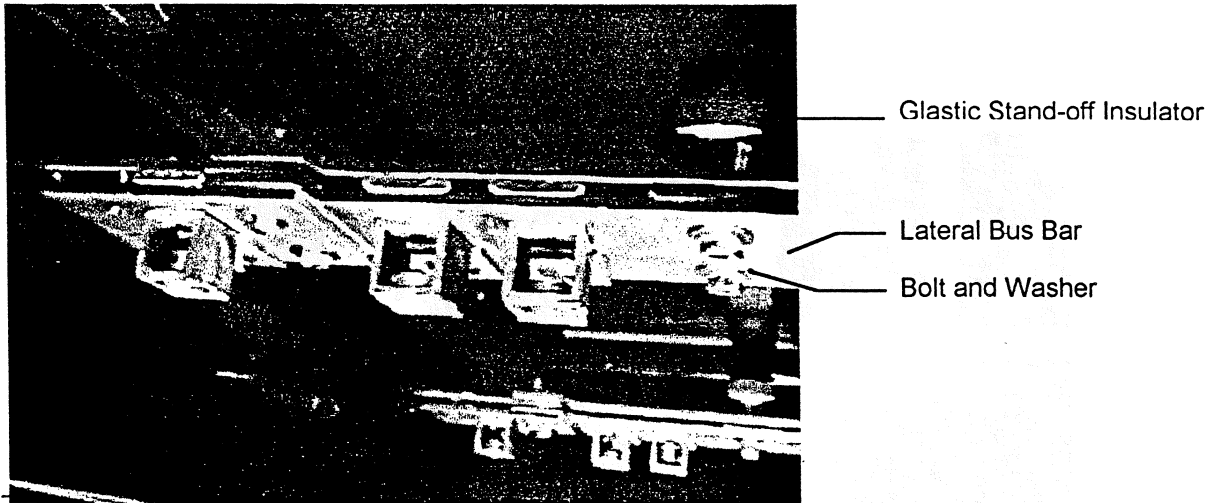


Figure 4: Lateral Phase Crossbussing, Top View Detail

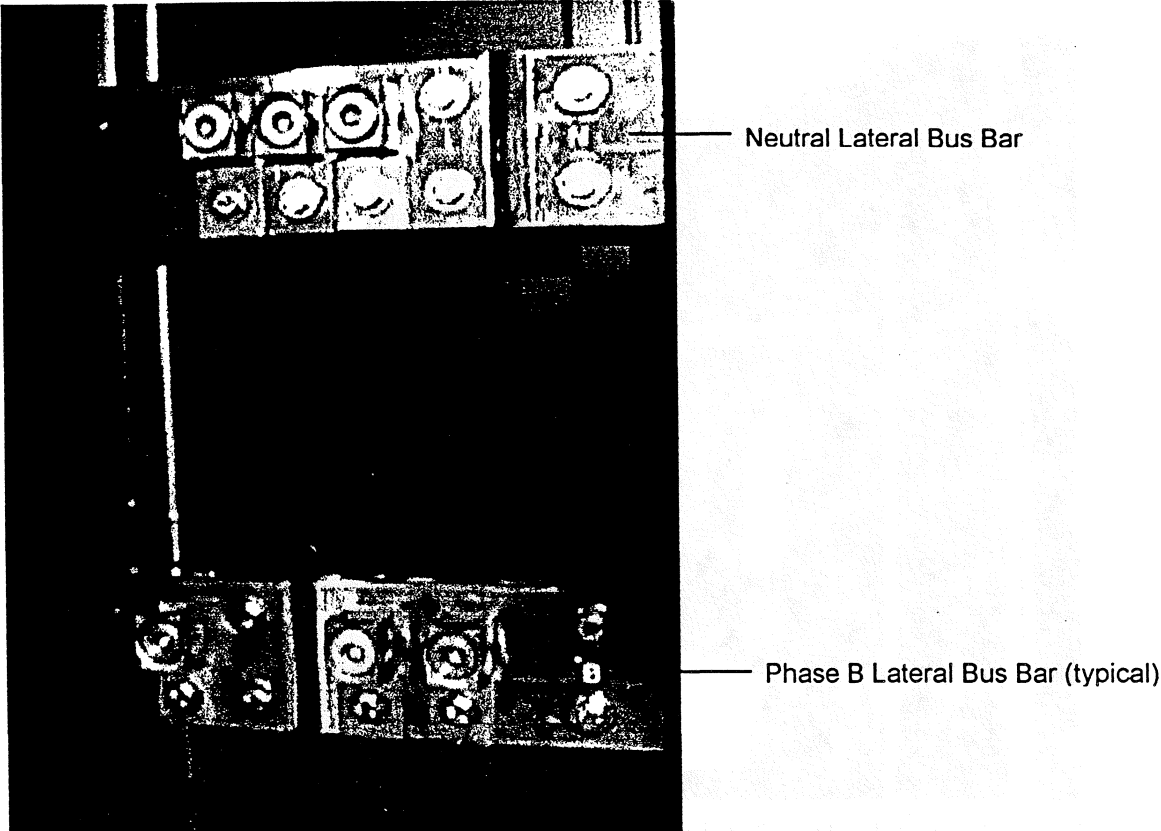


Figure 5: Bussing Detail, Front View

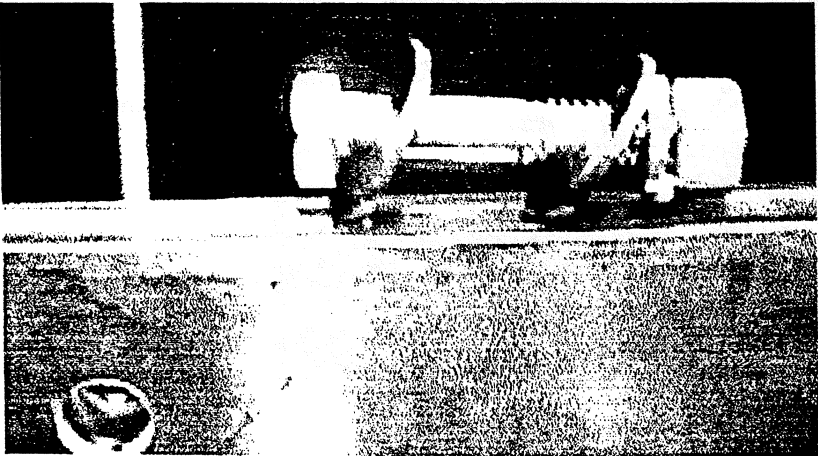


Figure 6: Bussing Nut, Washer and Bolt Assembly, Typical

4. Prepare Racks for Conduit Entry

The i Series dimmer racks feature removable conduit entry panels at both the top and the bottom of the rack. Refer to Figure 7 and Figure 8 for the locations of these entry panels. They are removable for ease in making custom conduit entry holes. Any conduit entry panels that are removed must be replaced to maintain proper airflow, or the rack will automatically shut down upon attempted operation.

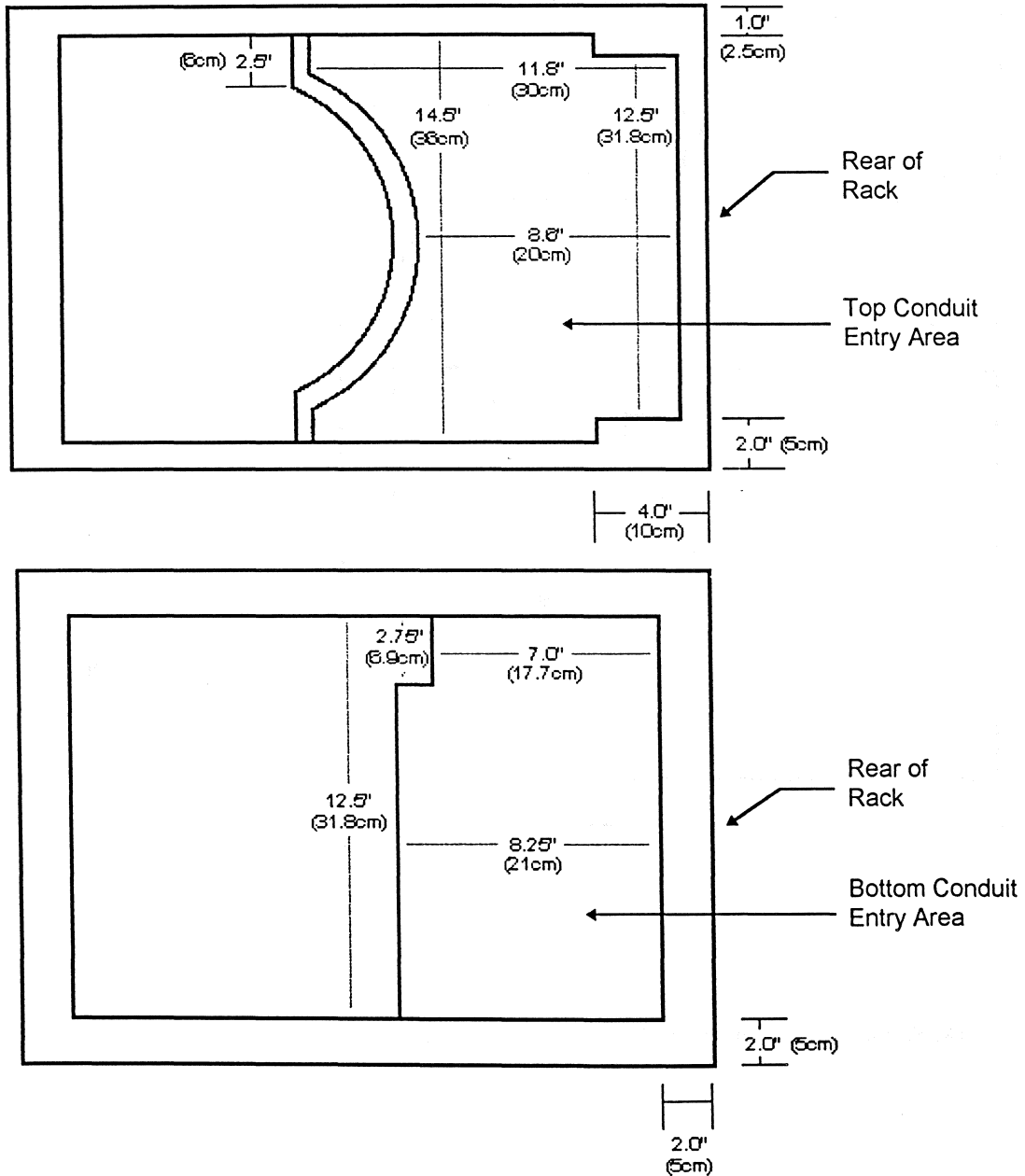


Figure 7: i96 Rack Top and Bottom Conduit Entry Areas

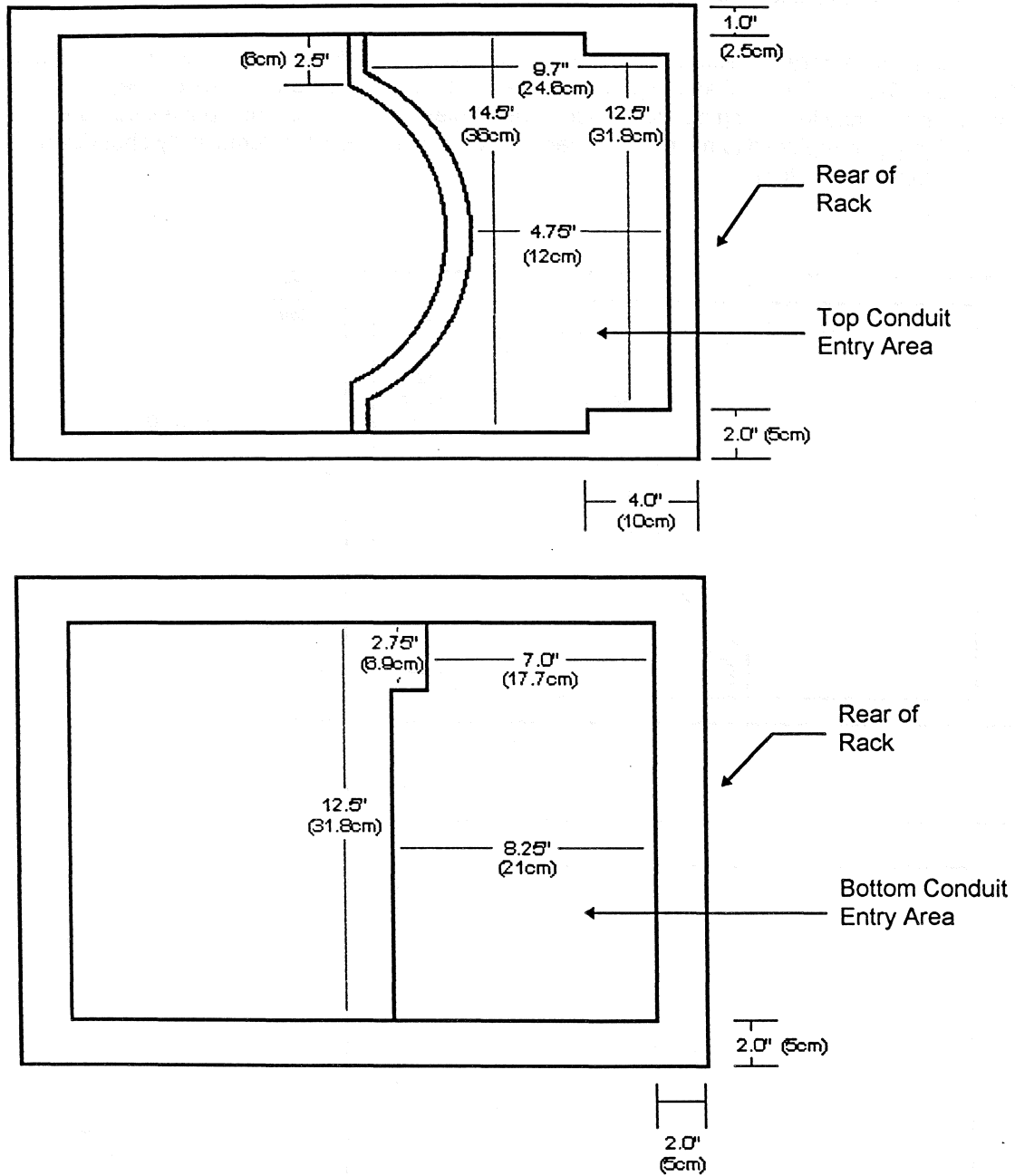


Figure 8: i48 Rack Top and Bottom Conduit Entry Areas

To gain access to the bottom entry panel, you must first remove the control module “mask” and tray located at the bottom of the rack. The mask is used to maintain airflow in racks that do not use a backup control module. Remove the two screws at the bottom front of the rack to remove the mask, if there is one, and the control module tray. See Figure 9. The dimmer module control cables and tray power cables must also be disconnected to remove the tray. See Figure 10. Remove the tray by pulling it forward.

Place the tray in a clean, secure place to protect the electronics inside.

Reinstall the tray only after:

1. the bottom entry panel is replaced, and
2. all necessary conductors are pulled through the bottom of the rack, and
3. the conductors are **terminated**, and
4. all conduit openings are sealed.

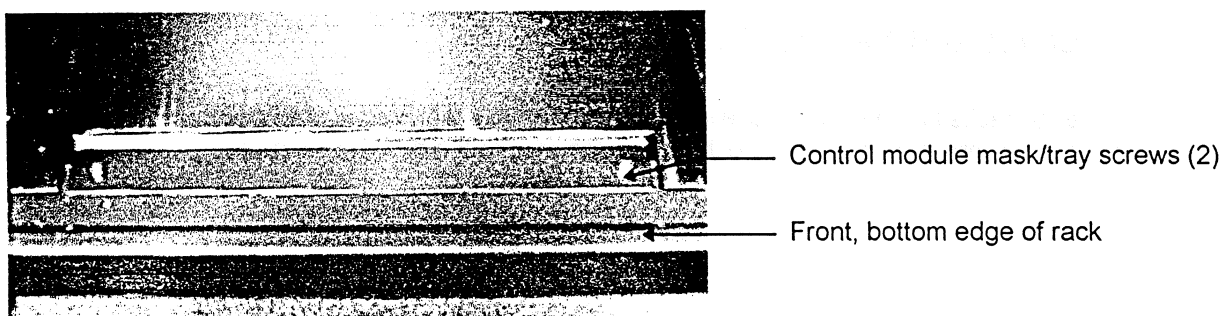


Figure 9: Control Module Tray Screws

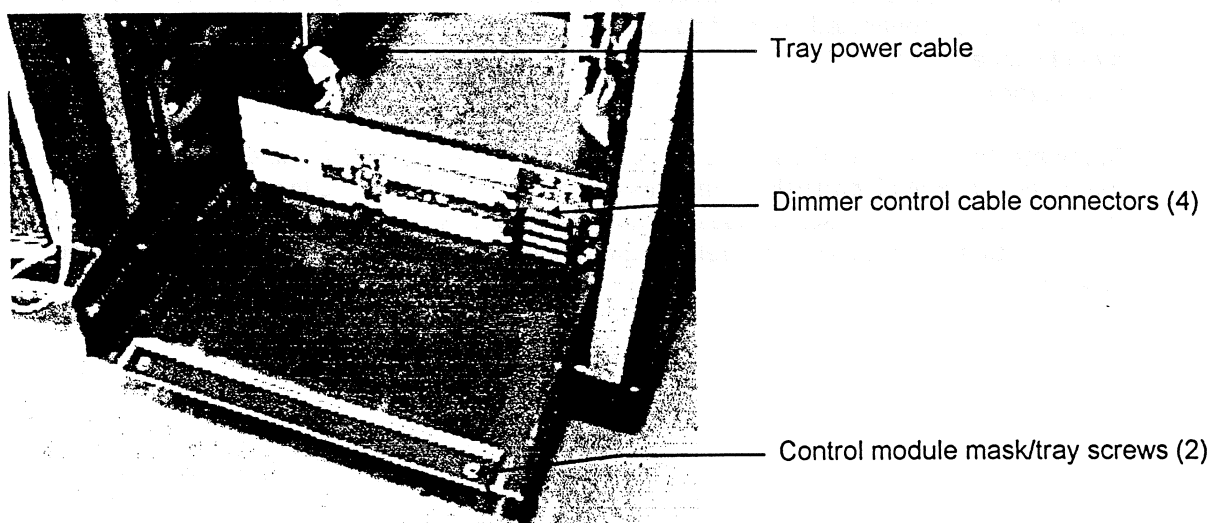


Figure 10: Removing Control Module Tray

5. Locate Racks

The *i* Series dimmer rack must be situated to meet the following environmental requirements:

- ◆ 12" (305mm) minimum clearance above fan
- ◆ 36" (914mm) minimum clearance in front for proper airflow and access
- ◆ a clean, dust free environment
- ◆ ambient temperature and humidity within specifications (see Specifications section at the end of this manual)
- ◆ a level floor

6. Level and Secure the Racks

Place the racks and adjust the leveling feet so that the racks are level and plumb. If no conduit is to enter the top of the rack, secure the top of the rack to the building structure.

7. Terminate Conduits

Terminate the line feeder conduit at the top or bottom conduit entry panels of the rack(s) containing the feeder lugs.

Terminate the load circuit conduits at the top or bottom conduit entry panels of the rack to which the loads will be connected. In most cases, this means the first 48 (*i48*) or 96 (*i96*) load circuits should connect to the first rack, the next 48 (*i48*) or 96 (*i96*) load circuits should connect to the second rack, and so on.

Terminate the control conduits at the top, or preferably the bottom conduit entry panels of the rack containing the control terminals. In most cases, this will be the rack to the extreme left, in a multiple rack system. (In some cases, control conduits may be fed to several or all racks in a multiple rack system. In all cases, refer to the wiring diagrams and drawings specific to each installation.)

8. Pull Line, Load, and Control Conductors

Pull all conductors into the racks. Line and load conductors must be copper, rated for operation at 90°C and sized for 75°C ampacity. Control conductors must be rated for operation at 85°C and are all Class 2. All control conductors must be routed internally so that they are not likely to come in contact with feeder or load conductors. Also, control conductors must not be installed in the same raceway along with power (line and load) conductors. Allow an extra 3-4 feet of control cable, since these will be the final terminations after all conduits are sealed. Dress the load conductors in the 2 load conductor guides provided (i96 only).

Caution: Racks marked with a short-circuit current rating higher than 10,000A retain that rating only if the feeder(s) are protected by a molded case circuit breaker, low voltage AC power circuit breaker, or fused switch with a short circuit current rating of no less than the rating marked on the rack.

9. Connect Line Feeders

Figure 11 indicates the typical single rack lug location. (If rack has been provided for single-phase, only lugs at A and C will be terminated.)

Note: Feeders may have lugs installed for bottom access which cannot be repositioned due to insulator installed in upper hole. If top access is required, insulator can be moved to bottom hole, and lug reinstalled in top hole. If for any reason lugs must be moved, they must be reinstalled with the hardware exactly as supplied and tightened to a torque of 20 ft-lbs. (27 N-M).

Connect the line feeders at the phase, neutral and ground lugs and tighten according to Table 1.

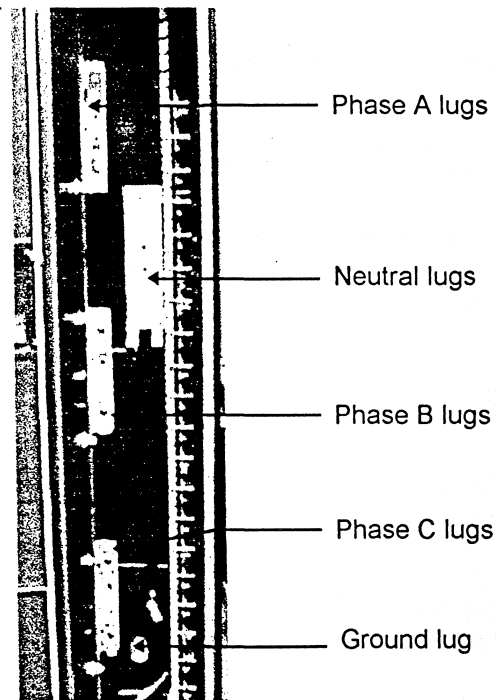


Figure 11: Typical Single Rack Lug Location

Terminal Type	Wire Size	Torque in.-lbs.	Torque N-M
Line Lugs - <i>i</i>96 (rated for 90°C copper only at 75°C ampacity) (alternate line lugs - <i>i</i> 48)	Single 1/0 AWG - 600 kcmil (54 - 304 mm ²)	375	42
	Dual 1/0-4/0 AWG (54 - 107 mm ²)	375	42
Line Lugs - <i>i</i>48 (rated for 90°C copper only at 75°C ampacity)	4 AWG - 350 kcmil (21 - 177 mm ²)	275	31
Ground Lugs - (<i>i</i>48 and <i>i</i>96) (rated for copper only)	6 AWG - 250 kcmil (13 - 127 mm ²)	375	42

Table 1 - Line and Ground Terminal Torque Ratings

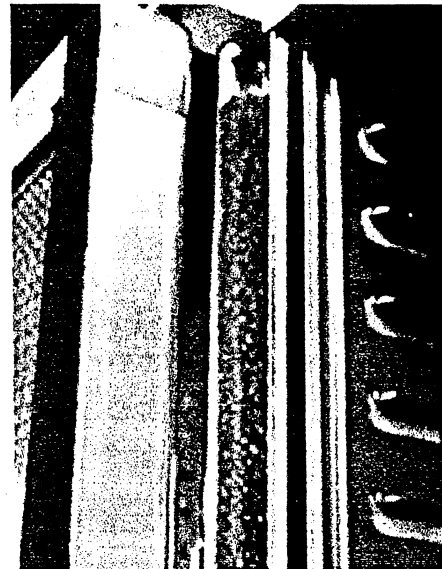
10. Label Circuits

One or more strips of labels, with vertically numbered circuit numbers is supplied with standard racks:

Part Number	Rack Type
4-0351	<i>i</i> 96 phase balanced
4-0352	<i>i</i> 96 sequential
4-0353	<i>i</i> 48 phase balanced
4-0354	<i>i</i> 48 sequential

The adhesive strips of labels should be placed on the inside face of the rack door. See Figure 12. These circuit labels are used as a guide for connecting the load conductors. Usually, the left-most cabinet begins with circuit numbers 1-48 (*i*48) or 1-96 (*i*96), and so on from left to right.

Note that the numbering scheme may be completely different for custom installations. Custom racks will have custom labels shipped installed to match the circuit schedule in the project drawings.



Apply label to this strip

Figure 12: Rack Label Strip Location

11. Connect Load and Load Neutral Conductors

The way the load and load neutral conductors are connected depends on the type of load, and the type of power module (dimmer or constant module) that is used by each terminal type. Follow the instructions for each load or power module type you are installing.

In all cases, use only 90°C copper wire rated at 75°C ampacity.

The torque ratings for the load and load neutral terminals are indicated in Table 2. These values apply regardless of what type of load or power module is being used.

Optional load ground terminal kits are available. They install on the bus support system between the Phase B and Phase C bussing.

Load Terminals (rated for 90°C copper wire only at 75°C ampacity)	Torque in.-lbs.		Torque N-M	
	Load	Ground	Load	Ground
Wire Type				
14 AWG - 10 AWG (2.1 - 5.3 mm ²)	50	35*	5.6	4.0*
8 AWG (8.4 mm ²)	50	40	5.6	4.5
6 AWG - 4 AWG (13 - 21 mm ²)	50	45	5.6	5.1
2 AWG (34 mm ²)	50	50	5.6	5.6

* Terminal suitable for 1 or 2 conductors

Table 2 - Load and Load Neutral Terminal Torque Ratings

11.1 Connecting Single Load Connectors for Incandescent, Low Voltage, Neon, and Cold Cathode Loads

The following instructions apply to wiring the power modules listed in Table 3, below. Consult the project drawings, if the rack is not a standard rack, to determine which of the slots in the rack are to be wired for this type of load connector.

Part Number	Voltage	Circuit Breaker	Load per Circuit	Description
4-0011	120	15A	1.8kW*	i500 Dual Dimmer
4-0012	120	20A	2.4kW**	i500 Dual Dimmer
4-0023	120	20A	2.4kW**	i800 Single Dimmer
4-0026	120	15A	1.8kW*	i800 Single Dimmer
4-0031	120	15A	1.8kW*	Dual Constant
4-0032	120	20A	2.4kW**	Dual Constant
4-0052	230	25A	5.0kW	i350 Dual Dimmer
4-0061	230	15A	2.5kW	i500 Dual Dimmer
4-0064	230	25A	5.0kW	i500 Single
4-0072	230	15A	2.5kW	i800 Single Dimmer
4-0074	230	25A	5.0kW	i800 Double High

* Load is 1.5kW at 100V

** Load is 2.0kW at 100V

Table 3: Single Load Connector Dimmer Module Types

Referring to Figure 13, connect the load wire for the first (upper) circuit breaker to the upper "A" load terminal, and the load wire for the second circuit breaker to the lower "B" load terminal. If the dimmer is a single, high rise-time type dimmer, terminate one load only to the lower "B" terminal, if two load terminals are provided.

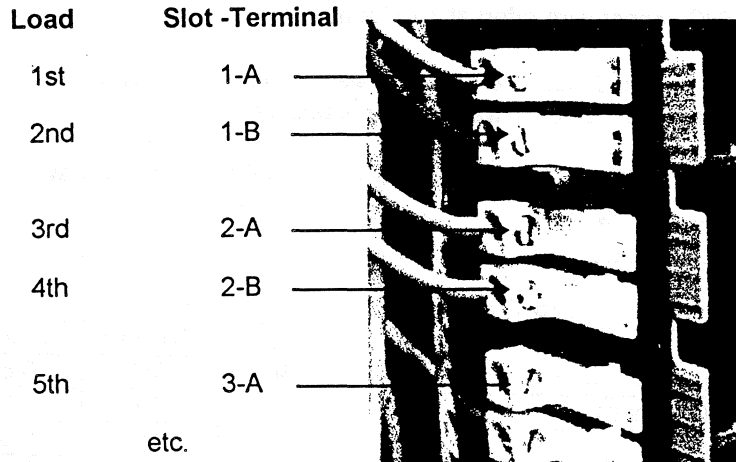


Figure 13: Connecting Load Wires to Single Load Connectors

Terminate their respective neutral wires to the corresponding neutral bus. The neutral bus is a copper panel in the center of the rack, on the same plane as the Line terminals. See Figure 14. Tighten load and neutral terminals according to Table 2.

Note: If 15 Amp and 20 Amp, 120V power modules are intermixed on the premises, they must both be wired as 20 Amp branch circuits as the modules are not separately keyed.

For facilities that require individual ground wires for each load circuit, an optional ground bus can be provided that looks similar to the neutral bus, and is located directly beneath it.

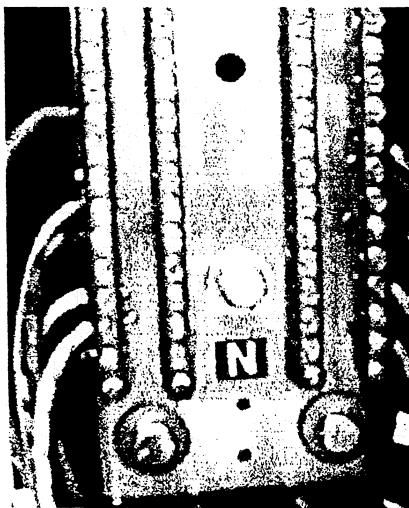


Figure 14: Neutral Terminals Location

11.2 Low Voltage, Neon, and Cold Cathode Applications Notes

When using *i* Series dimmer modules with transformer loads, the kW rating becomes the kVA rating. VA ratings are found by multiplying the input voltage (120V or 240V) by the current flowing in the transformer primary (120V or 240V side) for all transformers connected to the dimmer module. When calculating VA load, keep in mind that transformer losses add many VA to the published VA load rating of the transformer. When current cannot be measured, derate the kW rating of the dimmer module by 25% and add up the kW ratings of all lamps in the circuit.

CAUTION: *Operation of a dimmed transformer-loaded circuit with all lamps inoperative or removed may result in current flow or voltage in excess of normal levels. To avoid possible transformer overheating and possible premature transformer failure, Colortran strongly recommends the following:*

- a. Do not operate dimmed transformer-loaded circuits without operative lamps in place; and*
- b. Replace burned out lamps as quickly as possible; and*
- c. Use transformers which incorporate thermal protection or fuse transformer primary windings to prevent transformer failure due to over-current.*

For best results, transformers employed in transformer-loaded dimmed circuits should be high-quality units, well varnished and with an extra margin of magnetic material.

11.3 Connecting Forked Load Connectors for Incandescent and Low-Voltage Loads

The following instructions apply to wiring the dimmers listed in Table 4, below. Consult the project drawings, if the rack is not a standard rack, to determine which of the dimmer slots in the rack are to be wired for forked load connectors.

Part Number	Voltage	Circuit Breaker	Load per Dimmer	Description
4-0014	120	50A	6.0kW	i500 Single
4-0025	120	50A	6.0kW	i800 Double High

Table 4: Dimmer Module Types for Forked Load Connectors

Connections are similar to the 20 Amp device with the exception that there is only one load wire per module. Spaces designed for 50 Amp dimmers have special forked load connectors with only one wire terminal. See Figure 15. If the dimmer is a double-high, high-rise-time type dimmer, a load terminal will be provided in every other module slot corresponding to the lower part of the dimmer.

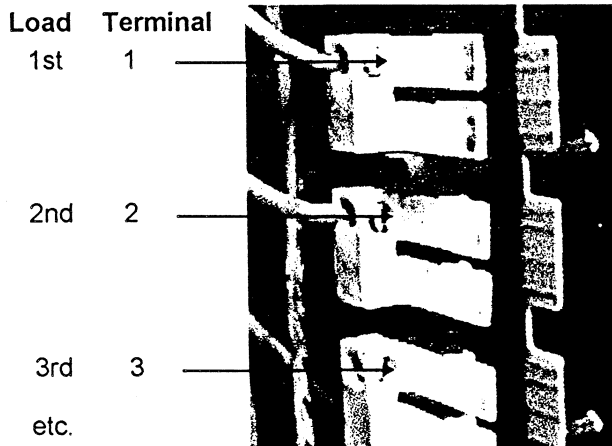


Figure 15: Connecting Load Wires to Forked Load Connectors

12. Seal openings

Seal any unused mounting and conduit access holes in the rack to maintain proper cooling airflow in the rack. If conduits are large and relatively empty or if they connect to a gutter nearby, they must be sealed as well.

Verify that both the top and bottom access panels are securely installed in each rack. Replace the control module tray in the bottom of the rack and re-connect its cables.

13. Connect Control Conductors

The control conductor terminals are located at the bottom of the rack, on the rack electronics backplane on the back face of the control module "tray." See Figure 16.

There are 5 types of control conductors:

- ◆ DMX/CMX dimmer data
- ◆ Panic
- ◆ Hand Held Terminal
- ◆ PC Serial
- ◆ Network (Ethernet type)

The types of control conductors that are required depends on the installation. In any case, either the data or the network conductors are usually required, as a minimum.

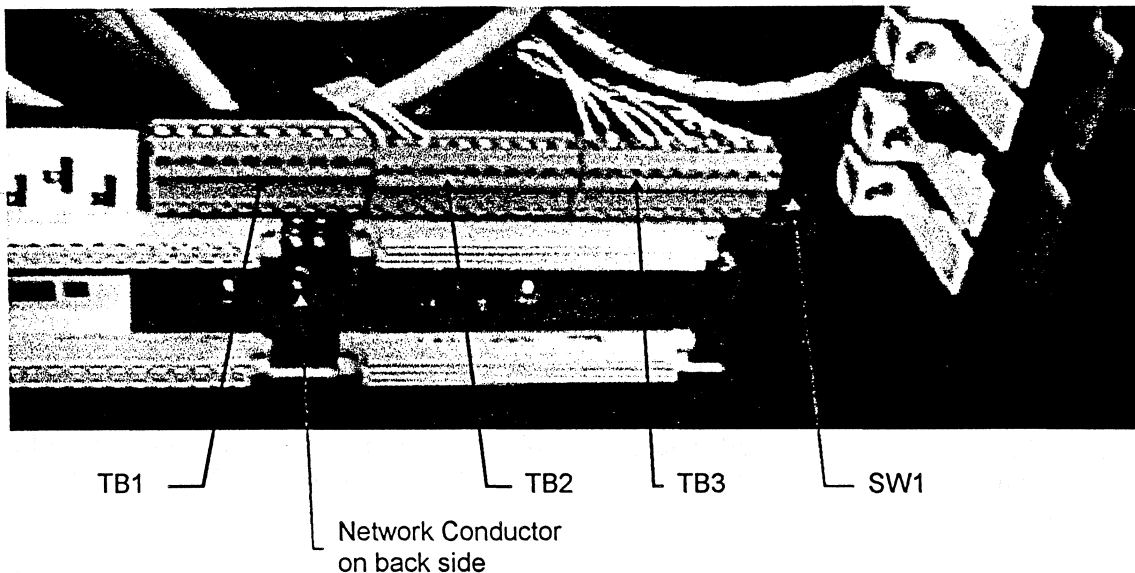


Figure 16: Control Conductor Terminals on the Rack Electronics Backplane

The TB identified terminal blocks feature removable terminal connectors in 3 sections. Each section of terminals may be removed and wired independently. Terminal identification is located on the backplane PCB underneath the removable terminal connectors.

Control terminals accept 24-14AWG (.25 - 2.5mm) wire. All cable shielding and all drain wires (wires connected to cable shielding) must be insulated. Some terminals may be factory pre-wired. Take care as to not disconnect or break terminations.

The Network connector is the coaxial connector located on the back side of the backplane PCB.

13.1 Terminate Block TB3: DMX/CMX Dimmer Data Conductors

On terminal block TB3, there are two dimmer data input termination points. They are labeled DMX0 and DMX1 on the PCB board. These terminals also act as outputs: the wiring may be daisy chained as outputs to other locations, such as other rack inputs. The terminal block is removable for ease in wiring. After the control conductors are terminated, reconnect the block to the rack electronics backplane. The data cable is a shielded dual twisted-pair Belden 9829 type cable. Refer to Table 5 for the proper termination of this cable.

See the Specifications table at the end of this manual for specifications on this cable. Substitute cables should be approved by Colortran before installation.

TB3	First DMX/CMX Input					Second DMX/CMX Input				
	Terminal #	1	2	3	4	5	6	7	8	9
Label	SHIELD	DMX0	DMX0	*	OTEMP	SHIELD	DMX1	DMX1	*	OTEMP
Pair #	Shield	1		2		Shield	1		2	
Color	Shield/ Drain Wire	WT w/BL stripe	BL w/WT stripe	Not used	OR w/WT stripe	Shield/D rain Wire	WT W/BL stripe	BL W/WT stripe	Not used	OR w/WT stripe
Reference Connector Pin #	1	2	3	4	5	1	2	3	4	5

* These terminals are not connected internally

Table 5: Block TB3 Dimmer Data Terminals

Standard systems are programmed to accept the cable containing the first 512 dimmer intensities in DMX format on the first input and CMX format on the second input. If more than one rack is involved, daisy chain the cable from left to right.

Racks are shipped with the DMX lines terminated. In all racks except the right end rack, remove this termination by switching SW1 on the backplane from "on" to "off" (to the left) for the desired line. Refer to Figure 16 for the location of SW1. If the racks are custom, refer to the project drawings for termination requirements.

The rack may be reprogrammed to accept DMX or CMX on either input, through the Hand Held Terminal or through the *i* Series PC Software.

These inputs comply with USITT standard DMX512/1990 except that wires 4 and 5 are used for an alternate purpose and circuitry. They also comply with Colortran's proprietary CMX digital transmission standard. Installation should be in accordance with the USITT Recommended Practice for DMX512. Both the Standard and Recommended Practice are available from the United States Institute for Theatre Technology in New York City.

13.2 Terminate Block TB1: Panic Conductors

The panic conductor terminations are used only if panic stations are included in the installation. If panic stations are not being used, then wiring to the panic terminals is not required.

The three types of panic signals are:

- 1a. Panic A as Single Switch Momentary Panic (push on, push off) and
- 2a. Panic B as Single Switch Maintain Panic (toggle on/off)
(this is the default configuration for Panic A and B)

or

- 1b. Panic A as Dual Switch Momentary Panic "On," and
- 2b. Panic B as Dual Switch Panic Momentary "Off"

and

3. LED (pilot) On

Each signal has its own pair of terminals. Terminal block TB1 is removable for ease in wiring. After the control conductors are terminated, reconnect the blocks to the rack electronics backplane. The standard Panic cable is Alpha 1896/6. For custom Panic stations, 20AWG (.75 mm²) or larger stranded wire may be used, or as specified on the project drawings. Refer to Table 6 for proper termination of this cable.

TB1 Terminal #	Panic A		Panic B		LED On	
	1	2	3	4	5	6
Label	PANIC_A	GND**	PANIC_B	GND**	PAN_LED	PAN_LED*
Color	Black	White	no standard	no standard	Green	Red
Reference Station Terminal #	1	3	no standard	no standard	4	2

* +5VDC

** GND is supply common and not earth ground

Table 6: Block TB1 Panic Terminals

The Panic A port will accept standard Colortran single-switch Panic Stations, Catalog Nos. LEC1993, LEC1998 and 600-809. Several stations may be wired in parallel.

Since the Panic port controls only the dimmers in the same rack, all dimmers in multi-rack systems that are to be operated in the Panic mode must be located in the same rack. If the Panic function must occur in multiple racks, contact Colortran for a custom two-button station. See project drawings for the proper wiring of custom panic stations. Two-button Panic stations may be wired using a single wire common to the two switches to GND.

Terminals 7 through 10 are for factory use only. If they were pre-wired at the factory, take care so as not to disconnect them.

13.3 Terminate Block 2: Hand Held Terminal and PC Serial Conductors

The Hand Held Terminal terminations are used to wire a connection to an optional external Hand Held Terminal port at a remote location. A Terminal connected to this port can program or monitor the rack or control dimmers. A Hand Held Terminal connector is also provided on the front of all control modules, and some door enclosures are prefabricated to accommodate an integral Hand Held Terminal. Terminal Block TB2 is removable for ease in wiring. After the control conductors are terminated, reconnect the block to the rack electronics backplane. If a remote Hand Held Terminal is not required, then wiring to this terminal is not required.

The data cable required for the Hand Held Terminal is Belden 9830 or equivalent. See the Specifications table at the end of this manual for specifications on this cable. Substitute cables should be approved by Colortran before installation. Refer to Table 7 for the proper termination of this cable.

TB2 also contains terminations to wire a connection to an optional external serial port on a PC. A PC connected to this port can configure or monitor the rack. A PC connector is also provided at the front of all control modules. The data cable is that which is standard for a PC serial port. The reference connector pin numbers in Table 7 are those of the standard 9-pin female D connector to be connected to the other end of the cable.

TB2	PC Serial Port				Hand Held Terminal Port					
Terminal #	1	2	3	4	5	6	7	8	9	10
Label	IAMOK	GND*	PCTXD	PCRXD	HHTXD	$\overline{\text{HHTXD}}$	HHRXD	$\overline{\text{HHRXD}}$	HH+12V	GND
Pair #	n/a	n/a	n/a	n/a	3		2		1	1/Shie
Color					GR W/WT Stripe	WT W/GR Stripe	OR W/WT Stripe	WT W/OR Stripe	BL W/WT Stripe	WT W/E Stripe a Shield/ Drain W
Reference Connector Pin #		5	2	3	6	5	4	3	2	1

* GND is supply common and not earth ground

Table 7: Block TB2 Hand Held Terminal Terminals

Terminal 1 is for factory use only. If it was pre-wired at the factory, take care so as not to disconnect it.

13.4 Terminate network conductors

Termination of the network conductors is only necessary in installations requiring network communications between the racks and to other ColorNet® network devices. (ColorNet® network devices are lighting control devices manufactured by Colortran that communicate through an Ethernet system. These devices include dimmer rack monitors, control consoles, peripheral controllers and dimmer racks.) For Hand Held Terminal communications across multiple rack systems, the network connections are also required. In multiple rack systems, the interconnecting network cable will be supplied with the racks and need only be connected.

Refer to the project drawing for the requirements of the system regarding network conductors. If wiring is required, industry standard IEEE 802.3 Ethernet Thinnnet wiring rules must be followed. This standard is available from IEEE in Piscatway, NJ.

Refer to Figure 17 for the location of the network connector, on the back of the control module tray. Standard racks are supplied with a terminating plug on the connector. This plug must be installed unless the rack is connected to a network. If the rack is connected to a network, the plug is removed and replaced with a T connector. If one end of the T connector is not connected to a coaxial cable, instal the termination plug into this end. If cables are made in the field, it is imperative that the connectors are installed exactly per the connnector manufacturer's instructions and with the tools specified.

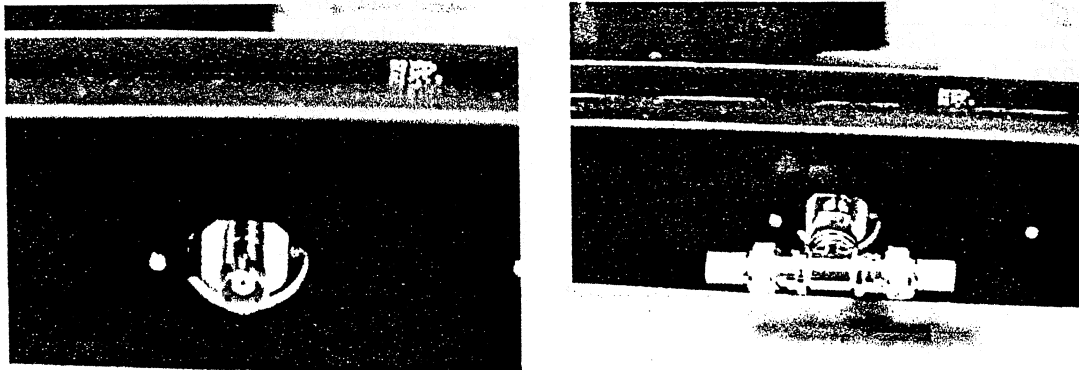


Figure 17: Network Conductor Terminations (on right, with BNC connector)

14. Apply power and check

Caution: High Voltage - all measurements with a meter and other operations within the rack must be with the rack de-energized, or by a qualified electrical installer exercising extreme care. Before the rack is filled with control modules, there will be exposed bussing carrying high voltage. Use extreme caution while working with an energized rack.

Apply power to the rack.

15. Unpack power modules

Unpack dimmer modules (and constant modules, if supplied). See Tables 8 (120V) and 9 (230V) for the part number, maximum load, voltage, and circuit breaker size of each module type.

Part Number	Maximum Load (120V)	Maximum Load (100V)	Circuit Breaker	Module Type	Rise Time
4-0011	1.8kW	1.5kW	15A	Dual Dimmer	500
4-0012	2.4kW	2.0kW	20A	Dual Dimmer	500
4-0014	6.0kW	5.0kW	50A	Single Dimmer	500
4-0023	2.4kW	2.0kW	20A	Single Dimmer	800
4-0025	6.0kW	5.0kW	50A	Double High Dimmer	800
4-0026	1.8kW	1.5kW	15A	Single Dimmer	800
4-0031	1.8kW	1.5kW	15A	Constant	
4-0032	2.4kW	2.0kW	20A	Constant	

Table 8: 120V Dimmer Part Numbers and Ratings

Part Number	Maximum Load	Circuit Breaker	Module Type	Rise Time
4-0052	5.0kW	25A	Dual Dimmer	350
4-0061	2.5kW	15A	Dual Dimmer	500
4-0064	5.0kW	25A	Single Dimmer	500
4-0072	2.5kW	15A	Single Dimmer	800
4-0074	5.0kW	25A	Double High Dimmer	800

Table 9: 230V Dimmer Part Numbers and Ratings (Foreign Service Only)

16. Install power modules

Caution: Racks marked with a short-circuit current rating higher than 10,000A retain that rating only if Colortran i Series dimmer modules are the only power modules installed.

Before installing each module, verify that its circuit breaker is off (to the right).

Caution: Once the power modules are installed, be sure the circuit breakers are off any time the rack is re-energized, until the Panic switches are set (See Section 19). Applying power to the rack while all the circuit breakers are on and all the Panic switches are on has the potential to cause damage to the feeder.

Slide each power module into the slot appropriate for its rating and module type (15,20 or 25 amp dimmers into single load connector slots and 50 amp dimmers into forked load connector slots). If system is custom, refer to project drawings. Begin with the bottom slot and build upward. The dimmer slots are keyed so that a larger capacity dimmer module cannot be inserted into a smaller capacity slot. If module will not seat easily, check to see if its ampere rating matches the slot. Do not force the keying system.

Push the modules in until they are seated firmly.

17. Install airflow modules

If there are less than 48 dimmer modules for an i96 rack (or 24 for an i48 rack), unpack and install airflow modules (part number 4-0099) in slots where there are no dimmers. This must be done to insure proper cooling when the rack is in operation.

Airflow modules look the same as power modules, but have no circuit breakers. They are installed the same way as other power modules.

Note: Rack should never be operated without *all* spaces filled; this insures proper cooling.

18. Test loads

While testing the loads, check the condition of the dimmers' load and status LEDs. These red and green LEDs, located on the right front side of the dimmer module, indicate if there is a problem with the dimmer, circuit or control module. With the dimmer circuit breakers off, the Status LED will be Steady Red and the Load LED will be Flashing Green. The table below describes this and the other conditions of these LEDs.

Status LED	Load LED (Green)	Indicates	Resolution
Green, Steady	Steady or Off*	Normal operation	None needed
Green, Steady	Flashing	1. Open circuit 2. Low or high load alarm**	1. Close circuit (connect load) 2. Check for proper load or change load alarm setting
Red, Steady	Steady or Off*	Panic condition	Install or replace control module(s) Release Panic closures
Red, Steady	Flashing	Circuit breaker tripped	Check load, then reset circuit breaker
Red, Flashing	Steady or Off *	Overtemp warning	Check and correct airflow
Red, Flashing	Flashing	Overtemp shutdown	Check and correct airflow
* The Load LED is "load tracking" - its brightness indicates the level of the load in use. If it is off, then it has a load, but its level is 0%. ** The load alarm is set as a part of rack configuration and would not be a cause of this LED condition during the load test, unless the rack has already been configured.			

Table 10: Dimmer Module LED Conditions

With the control modules not in use, the rack is in a "Panic" mode, and the dimmer modules may be turned on without the use of an external control source, simply by turning on the breakers.

Test the loads by turning each circuit breaker on, then off.

As the breakers are turned on, the dimmer's load should turn on to 100% and the dimmer module's load LED(s) should change from flashing to steady green, indicating that the load is being turned on because the dimmer module is in Panic mode. If the load does not respond, the panic switches may have been accidentally turned off for that dimmer module slot. Remove the dimmer and read Section 19 for information on setting the panic switches.

If the panic switches are set correctly, but the load does not respond, verify that the dimmer status and load LEDs are in the proper condition, then verify the presence of a load and/or the integrity of its wiring.

19. Set Panic Switches

Caution: *Do not operate these switches while the rack is energized.*

The Panic switches determine which dimmers will turn on when the rack is put into Panic mode. See Figure 18 for the location of the Panic switches.

The rack is shipped with all Panic switches in the On position, for purposes of rack testing.

Caution: *Once the power modules are installed, be sure the circuit breakers are off any time the rack is re-energized, until the Panic switches are set. Applying power to the rack while all the circuit breakers are on and all the Panic switches are on has the potential to cause damage to the feeder.*

19.1 Operation of Panic Mode

Panic mode is triggered by any Panic Station wired into the rack control terminals, or if both control modules are removed from the rack or are non-functional. The Panic station may be a momentary or latched switch. Once the rack is in Panic mode, the dimmers that have their Panic switches in the ON position are energized. Any dimmer that has its Panic switch set to OFF will not be turned on, but will maintain its level at the time the rack is placed in Panic mode. When the rack is placed in Panic mode, any dimmer control inputs are ignored, and the dimmer levels are held until the rack is taken out of Panic mode. If the latched Panic switch is used, the system will not be able to exit Panic mode until the switch is unlatched.

For temporary site lighting, set the Panic switches to on for the appropriate dimmers, and turn on the circuit breakers for those dimmers. As long as the control modules are not installed, the lights associated with those dimmer modules will remain on.

19.2 Setting the Panic Switches

Caution: Do not operate these switches while the rack is energized.

Remove the modules for the desired Panic circuits. The Panic switches are located on the printed circuit boards on the opposite side of the load terminals. See Figure 18. The switches are in groups of two per block, spaced evenly to correspond to each load terminal pair. If the switch is moved "down," or towards the printed circuit board, then the switch is ON. If the switch is "up," away from the printed circuit board, then it is OFF. There are a total of 96 switches per rack, two for each possible dimmer slot.

In cases of forked load connectors, select panic for the dimmer module by selecting the lower switch (of the lower slot, in the case of a double-high dimmer module).

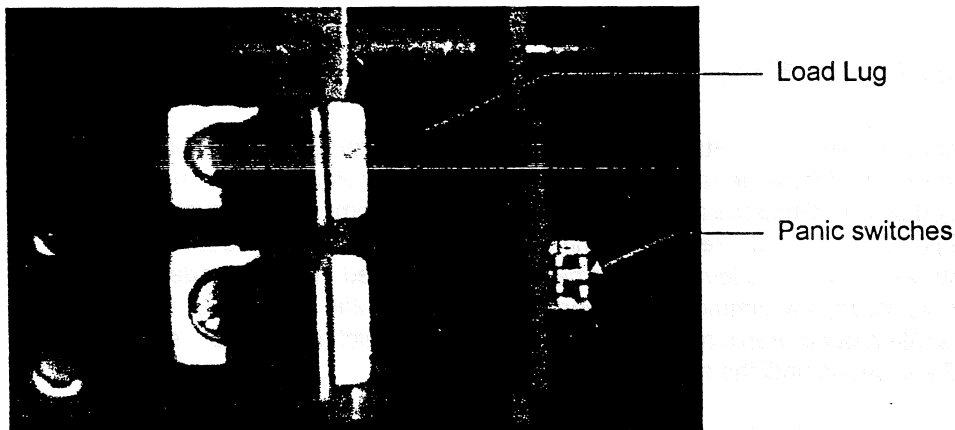


Figure 18: Panic Switch Location

**If your system comes with
Engineering Check-Out (ECO), stop here.
(See page "i".)**

20. Install control modules

Install one or two *i* Series Control Modules (part number 4-0311 for 120V, or 4-0312 for 230V) in the control module slots in the tray at the bottom of the rack. Refer to Figure 19.

These control modules are installed by sliding them towards the back of the rack until they are fully seated. As the control module is becoming seated, push the two handle-tabs towards the face of the control module to lock it into place. No physical wiring is required to install the control modules.

If only one control module is installed, then the control module mask that was shipped with the rack must be re-installed in the lower slot to maintain proper airflow in the rack.

Verify their operation by noting if all three phase LED's are on (Phase A and C only if system is single-phase, 3-wire).

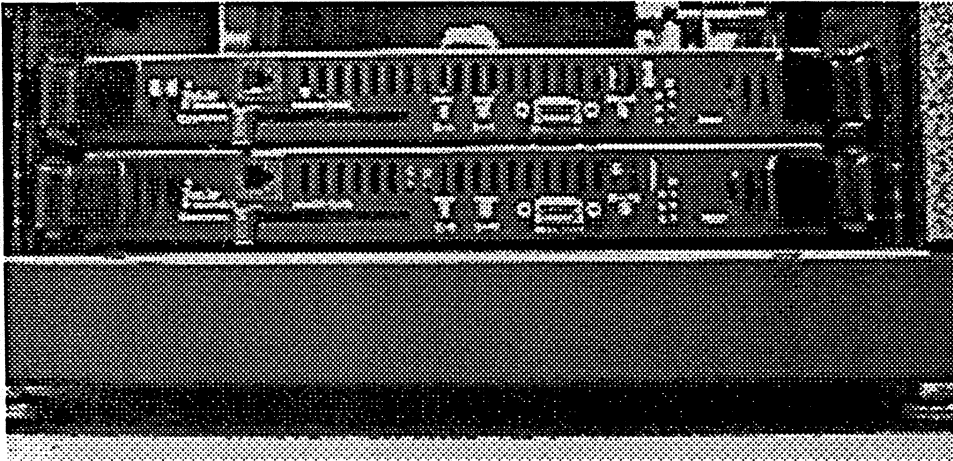


Figure 19: Control Module Installation

21. Set Module On Line button

The Module On Line button is used only in racks that have two control modules installed. The second control module is used as a backup device only, and is not required for the rack to operate. This backlit button indicates which module is in use, and which control module is in a "standby" state. If the button is lit, then that control module is in use. If the button is not lit, then the control module is in a "standby" state.

If the button is flashing, one of the following conditions exists:

1. Overtemp condition in one or more of the dimmer modules
2. Overcurrent condition in one or more of the dimmer modules
3. Excessive or low line voltage on any phase of input power
4. Corrupt control signal (DMX or network)
5. Mis-wiring of input power
6. Control module internal failure

To select the control module to be "in use," depress the module On Line button. See Figure 20.

In case of a control module failure, the rack will automatically switch to the "standby" control module. In either case, if the control module is selected manually or by default, the control module currently in use features a lit Module On Line button.

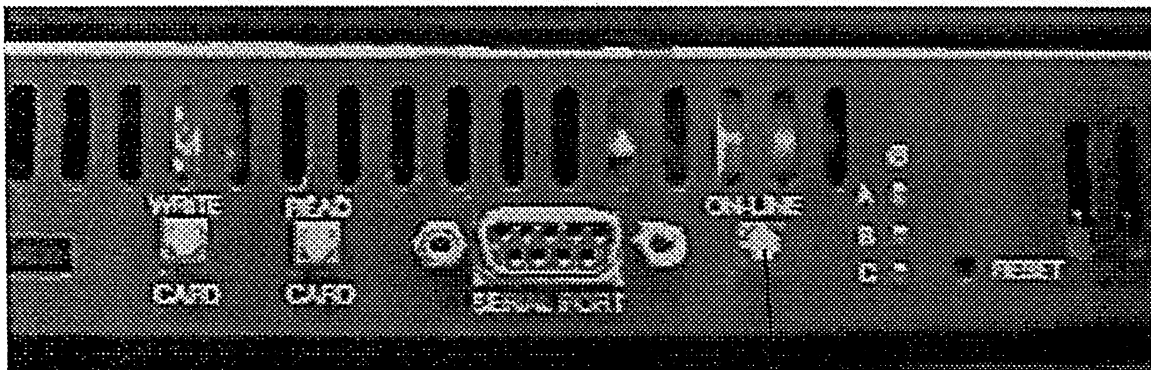


Figure 20: Module Select Button Location

Module On Line button

22. Install Hand Held Terminal

The Hand Held Terminal (part number 4-0301) is an optional peripheral which allows for the monitoring and configuration of an i96 Series dimmer rack. Each rack may have its own Hand Held Terminal, providing the rack has the proper door configuration to accommodate the mounting and wiring of the terminal.

Refer to Figure 21 and Figure 22 while executing the following installation procedures:

1. Unpack the Hand Held Terminal.
2. Place the Hand Held Terminal in the inner face of the rack door in the slot provided. To place the Terminal in the slot, first raise the top and side clips and slide the Terminal under the side clips so that its LCD panel faces out the rack door when the door is closed. After the terminal is in place, lower the top clip.
3. Dress the Terminal cable by looping it around the provided brackets, as illustrated. ***It is important to dress the cable in this way in order to maintain proper airflow.***
4. Connect the Hand Held cable to the connector converter block. The connector converter links the Hand Held to an extension cable which is pre-wired through the rack door to connect to the control module.
5. At the bottom front of the rack, locate the termination of the extension cable and connect it to the User Interface connector located on the front of the control module. See If the rack contains two control modules, connect the hand held to the control module that is "in use" rather than the one that will be in "standby" mode.

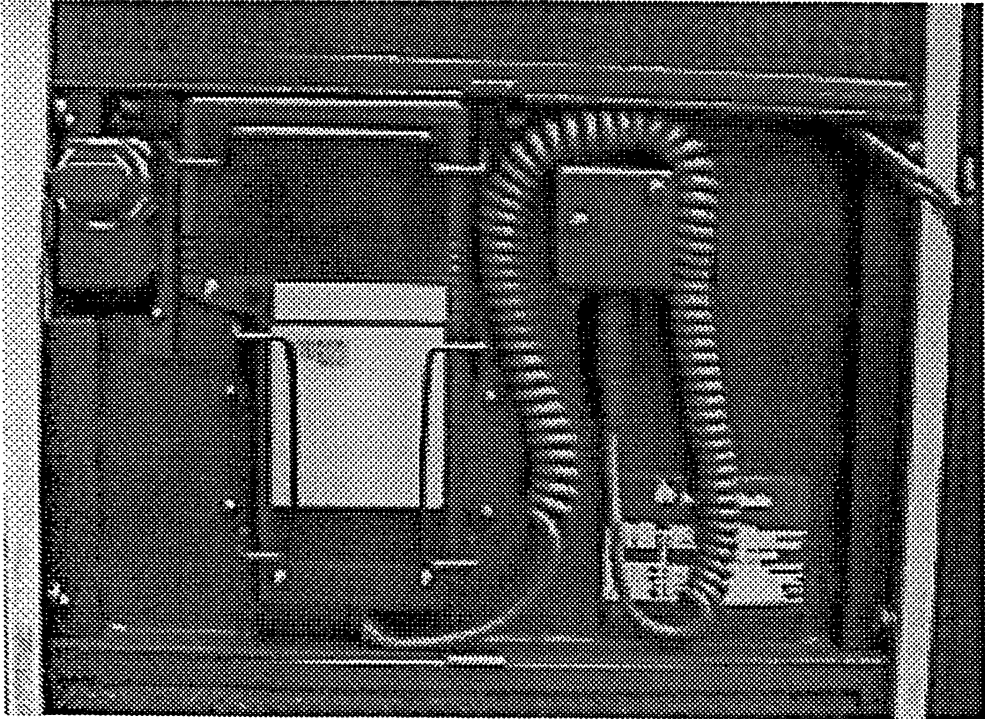


Figure 21: Hand Held Terminal Installation

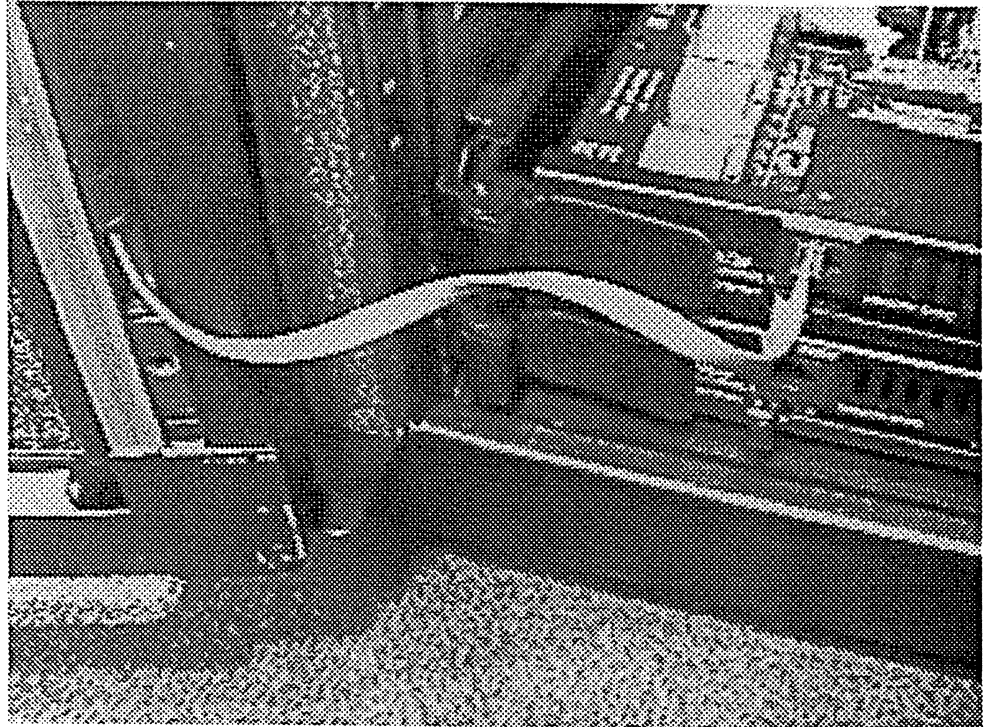


Figure 22: Hand Held Terminal Extension Cable Connection

23. Configure Rack

Once operation of the hardware in the rack has been verified, the control module of the rack may be configured. Configuration of the control module includes the following settings:

- ◆ type of dimmer in each slot
- ◆ dimmer number of each dimmer slot
- ◆ performance settings for each dimmer number (load alarms, response speed, etc.)
- ◆ special features for each dimmer number (min/max levels, non-dim, etc.)
- ◆ remapping of data inputs to dimmers
- ◆ pile-on of multiple data inputs to the dimmers
- ◆ backup mode settings

Custom racks are configured per project drawings. Standard racks are shipped configured as follows:

Rack Name	Rack 1
Target Voltage (depends on rack model)	115 or 230
Phases	3
Slots (depends on rack model)	48 or 24
Slot Names Numbering (depends on rack model)	Phase balanced or Sequential
Module Type	All dual
Line Regulation Speed	Fast
Resistance Compensation	Off
Response Time Speed	Fast
ENR	Off
Load Value	0
Load Alarm	Off
Temp Alarm	110
Voltage Alarm	Off
Protocol Setting, Input A	DMX
Protocol Setting, Input B	CMX
Echo to Net (Inputs A and B)	Off
Echo to Net (Inputs D Analog)	On
Inputs (A and B) Enabled	On
Inputs (D Analog) Enabled	Off
Pile-on Source 1	A (local DMX)
Pile-on Source 2	B (local CMX)
Priorities	0 (both, pile-on)
Remapping (depends on rack model)	Phase balanced or Sequential
Minimum Level	0
Maximum Level	100
Non Dim Level	0 (Off)
Profile	0 (None)
Normal Backup Mode Entry	Hold Look 0 seconds, Fade Out 2 seconds
Forced Backup Mode Entry	Go To Look 1
Owned VPCs	VPC1

Table 11: Standard Rack Configuration

Configuration of the control module can happen through any of the following sources:

- ◆ an IBM compatible PC with the configuration software and a serial cable
- ◆ a pre-programmed Memory Card
- ◆ a Colortran field service engineer
- ◆ a rack Hand Held Terminal

Instructions for using the Hand Held Terminal and the PC configuration software are contained in their respective user's guides. Instructions for using a Memory Card are outlined below.

24. Memory Card

The memory card is a storage device that holds information about the rack configuration and any backup looks created for the rack. It is an EEPROM card, about the size and shape of a credit card, and may be read from and written to as many times as is needed for rack maintenance. See Figure 23 for the location of the memory card slot on the control module.

The memory card is merely a device used to backup the rack configuration and looks; it is not required for the rack to operate. The rack configuration may also be backed up as a file on a PC hard drive or floppy disk, however, these forms of backup do not include copies of the backup looks.

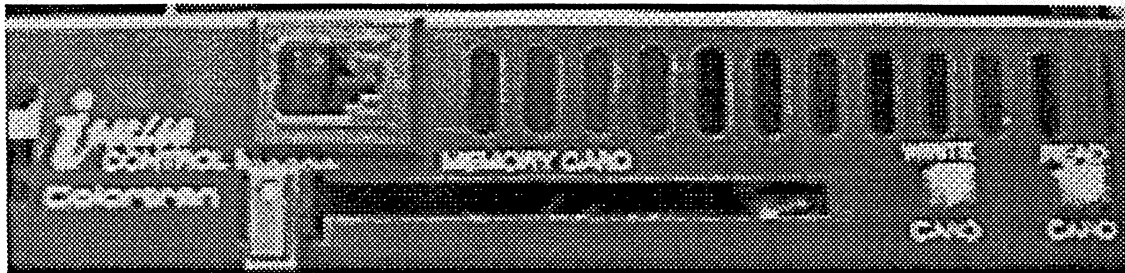


Figure 23: Memory Card Slot Location

Writing to a Memory Card

Writing to a memory card causes all information about the rack to be copied from the rack memory to the card. Any information previously stored on the card is erased. It is not necessary to "format" the card in any way prior to writing to it. It is not possible to "update" only part of the rack data to the card; all of the rack information is completely updated with each write, and all of the card is completely overwritten in this procedure.

The data of only one rack may be stored on each card; each rack that is configured differently requires a separate card.

To write to a memory card:

1. Insert the card in the slot provided, with its silver bar down and in first.
2. Firmly push the card into the slot as far as it will go without forcing it.
3. Push the Write button. Its light will begin to flash at a fast pace, and will continue to flash for 5 seconds, indicating that the control module is "armed" for the write command.
4. WHILE THE LIGHT IS FLASHING, press the Write button again. This initiates the writing procedure. The light will stop flashing, and instead, will be constantly illuminated. (If the light stops flashing before the Write button is pushed a second time, the control module has "disarmed" the write process.)
5. When the control module has finished writing to the card, the light will turn off. Do not remove the card until the Write light has turned off. If the light starts to flash at a slow rate after attempting to write, then an error occurred, and the write was not successful. Remove the card and re-attempt the write procedure from step 1.
6. To remove the card, either gently pull it out, or lift the small eject handle (on the left side of the slot) and push it into its slot.

Reading from a Memory Card

Reading from a memory card causes all information stored in the memory card to be copied from the memory card to the rack memory and to the memory of the control modules contained in the rack. Any information previously stored in the rack and control module(s) is erased. Attempting to read a blank card will cause a read error, but will not replace the memory of the rack or control modules.

It is not possible to "update" only part of the card data to the rack; all of the rack information is completely updated with each read.

Caution: Be sure of the contents of the memory card before reading from it, as the replaced memory is irretrievable (if not archived on a PC or another memory card).

To read a memory card:

1. Insert the card in the slot provided, with its silver bar down and going in first.
2. Firmly push the card into the slot as far as it will go without forcing it.
3. Push the Read button. Its light will begin to flash at a fast pace, and will continue to flash for 5 seconds, indicating that the control module is "armed" for the read command.
4. WHILE THE LIGHT IS FLASHING, press the Read button again. This initiates the reading procedure. The light will stop flashing, and instead, will be constantly illuminated. (If the light stops flashing before the Read button is pushed a second time, the control module has "disarmed" the read process.)
5. When the control module has finished reading the card, the light will turn off. Do not remove the card until the Read light has turned off. If the light starts to flash at a slow rate after attempting to read, then an error occurred, and the read was not successful. Remove the card and re-attempt the read procedure from step 1.
6. To remove the card, either gently pull it out, or lift the small eject handle (on the left side of the slot) and push it into its slot.

25. Close door

Close the front access door. This is necessary to preserve proper airflow and air filtering. The door may also be locked to prevent unauthorized tampering with or removal of the dimmer or control modules.

Basic Troubleshooting

Dimmer modules: See Table 10: Dimmer Module LED Conditions.

Control modules: Verify that all three phase LEDs are lit (phase A and C only if system is single-phase, 3-wire). If not, proceed as follows:

1. Check to see if module is fully plugged in.
2. Remove the module and check the fuses inside on the rear left hand corner of the circuit board.

If these actions do not solve your problem, refer to the last page of the manual for technical assistance.

Maintenance

Caution: Do not perform maintenance with the rack energized.

Dust Removal

Every six months (or more often, if the environment is particularly dusty) any accumulation of dust should be cleaned from the rack. An accumulation of dust can impede proper airflow and lead to overheating of dimmer or control modules. The following areas should be checked and cleaned:

- ◆ door air filters
- ◆ door air vents
- ◆ vents around hand held terminal door enclosure
- ◆ fan grilles
- ◆ dimmer module air intake openings
- ◆ control module air intake openings

The door air filters should be cleaned by washing them. To wash them, first remove them as you would a household window screen: push the bottom of the frame up, then out of the track. Clean the filters by spraying water through them. If the filters are particularly dirty, a soapy, grease-cutting cleaner may be used to remove the dirt, but the filters must then be rinsed with water. The air filters must be completely dry before they are reinstalled in the rack door.

Removal of dust from the vents, grilles and air intake openings can be done with compressed air or a vacuum.

Wire Termination Integrity

Every six months, check wire terminations for tightness: bus to bus, bus to lug, and lug to terminal or wire. Refer to Tables 1 and 2 for the terminal-to-wire torque ratings and to Section 3, Reassemble Multiple Rack Systems on page 2 for other torque ratings.

Specifications: i Series 96 and 48 Racks

Rack Capacity (96/48)	96/48 Circuits, 20 (120V) or 25A (240V) Amp max. per circuit 48/24 Circuits, 50 Amp max. per circuit
Dimensions	86" H x 17" W x 24" D 50" H x 17" W x 24" D
Weight	i96 rack: 330 lbs (151 kg) Empty 650 lbs (294 kg) Full i48 rack: 175 lbs (80 kg) Empty 340 lbs (155 kg) Full Add 12 lbs. (5.5kg) for each 800 Amps lateral bussing
Conduit Entry Areas	See section 4
Maximum Fan Noise Rating	71 dba
Ambient Operating Temperature	0°C (32°F) to 40°C (104°F)
Maximum Operating Humidity	90% without condensation
Maximum Feeder Size	800 Amp (400A for i48 rack)
Nominal Input, 120V Circuits	120/208V, 3Ø, 4W, 50/60Hz or 120/240V, 1Ø, 3W, 50/60Hz
Nominal Input, 240V Circuits (foreign service)	240/415V, 3Ø, 4W, 50/60Hz or 240/480V, 1Ø, 3W, 50/60Hz
Phase-to-Neutral Operating Voltage	100-127V ± 10% or 220-240V ± 10%
Operating Frequency	50 ± 5Hz or 60 ± 5Hz
Rack Enclosure	NEMA type 1 for indoor use only (utiliser dans un edroit a l'arbi)

Specifications: Belden Cable 9829 and 9830

24 Gage; Stranded Conductors (7x32); Polyethylene Insulated; Beldfoil 100% Shield Coverage; 30V; 80°C; Tinned copper; twisted pairs

Trade No	No. of Pairs	Nominal D.C.R		Nom. Imp. (ohms)	Nom. Vel. of Prop.	Nominal Capaciance	
		Cond.	Shield			* pF/ft.	** pF/ft.
9829 NEC CM CSA PCC FT 1	2	24 (7x32) 24.0Ω/M' 78.7Ω/km	3.71Ω/M' 12.17Ω/km	100	66%	15.5	27.5
9830 NEC CM CSA PCC FT 1	3	24 (7x32) 24.0Ω/M' 78.7Ω/km	3.86Ω/M' 12.66Ω/km	100	66%	15.5	27.5

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Warranty, Return and Service Information

NSI Corporation Limited Warranty

NSI Corporation and Colortran a division of NSI Corp. warrants new products to be free from defective materials and workmanship for a period of one (1) year from the date of purchase to the original owner when purchased from an authorized NSI or Colortran dealer.

The purchaser is responsible for completing and mailing to NSI, within 15 days of purchase, the warranty registration card enclosed with each product. NSI products that have been subject to accident, alteration, abuse, or defacing of the serial number are not covered by this warranty. The normal wear and tear of items such as knobs, jacks, and switches are not covered under this warranty.

If your NSI or Colortran product requires service during the warranty period, NSI will repair or replace, at its option, defective materials provided you have identified yourself as the original owner of the product to NSI or any authorized NSI / Colortran dealer. Transportation charges to an authorized dealer or the NSI factory for repair shall be the responsibility of the owner. All products returned to NSI must have factory authorization for return prior to shipping.

NSI Corporation is not liable for any incidental or consequential damages resulting from defect or failure other than repairs of the NSI / Colortran product subject to the terms of this warranty. This warranty gives you specific legal rights, and you may have other rights which vary from state to state. This warranty is expressly in lieu of all other agreements and warranties expressed or implied except as may otherwise required by law.

Return Policy

Any equipment bought from Colortran that fails within the warranty period may be returned for repair or replacement at Colortran's discretion, at no charge excepting freight, unless damaged by abusive use.

Prior to any return, please call Colortran Service at (800) 959-6004 for a Merchandise Return Authorization number (MRA#).

Service

For additional technical assistance, please contact the nearest Colortran Field Service office.

Colortran Field Service Office:

20497 SW Teton Ave.
Tualatin, OR 97062

(800) 959-6004
(818) 506-3328 (after-hours urgent business)
(503) 404-5600 (fax)